

MULTIPLE AND CONSECUTIVE OPERATIONS UPON THE KIDNEYS FOR CALCULI.

BY W. WAYNE BABCOCK, M.D.,

OF PHILADELPHIA,

Professor of Surgery in the Medical Department of the Temple College,
Surgeon-in-chief to the Samaritan Hospital.

DESPITE the voluminous literature dealing with stone in the kidney, two problems at least have not been exhausted. The first concerns the tolerance of the renal substance of extensive or repeated operative traumatism; the second, the frequency with which it is necessary to do consecutive operations upon the kidneys for nephrolithiasis. Watson's¹ recent article indicating that no successful bilateral nephrolithotomy has been reported indicates the lack of literature upon the subject. That the only successful case of bilateral nephrotomy for calculi is the one reported by Watson is scarcely to be credited. It seems more likely that other surgeons have, like myself, operated at the same time upon both kidneys for stone, but have delayed or neglected the report of their cases. Five years ago I did a double nephrotomy for bilateral calculus disease upon one of the patients whose history is appended. About a year later I again operated upon the same patient, doing a bilateral nephrolithotomy. In the following year one kidney was again drained and in 1905 a nephrectomy was done. Finally, in 1906, the remaining kidney was opened and a number of recurrent calculi were removed, this making the third consecutive nephrolithotomy upon the same kidney, and a total of seven operations upon the kidneys in a single case, from all of which the patient recovered. Another patient who recently had a nephrectomy had been subjected to five previous operations upon the kidneys for stone or the resultant suppuration,—a bilateral nephrotomy and nephrostomy having been performed at one time. These and five other cases herewith reported illustrate the feasibility of incising or exploring both

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kidneys at the same time, of doing consecutive operations upon the same kidney or the not infrequent tendency for calculi to reform after removal.

The tolerance of the kidney to operative procedure is greatly enhanced by the power of regeneration and hyperplasia possessed by the organ. In those cases in which a single kidney is found at birth, the organ is usually twice and at times thrice the average size; only infrequently is the size found to be normal. Likewise, after the removal of a single kidney or its destruction by disease, a compensatory enlargement of the other kidney is usual. Normally, the amount of excreting tissue in the kidney is far in excess of the average need. Life may continue when but half or two-thirds of a single kidney functionates; and it is evident that if life may continue with but a portion of a single kidney active, that the hyperplasia which may gradually follow surgical resections should progressively tend to increase the eliminating capacity for urine, provided destructive inflammatory processes do not occur. From this it would seem that the ability to do consecutive operations upon the kidney involving the removal or destruction of a part of the renal substance should be limited only by the ability of the organ to withstand the immediate trauma, and its power to regenerate after the repeated surgical injuries. The most potent factor in preventing regeneration is infection. Pyelitis and pyelo-nephrosis lead to progressive destructive changes in the renal parenchyma, inhibit tissue regeneration and hypertrophy, and may render consecutive, conservative measures inadequate or inadvisable and a recourse to nephrectomy needful.

Recurrence of Renal Calculi.—Under certain conditions the reformation of stones after nephrolithotomy is to be expected. These conditions include all the factors tending to the formation of stone, which remain after the operation such as:—

(1) *Infection.*—The most important factor in the primary formation of calculi is the presence of bacteria which produce chemical changes in the urine, causing soluble substances in the urine to be precipitated in the form of insoluble compounds. If,

therefore, infection of the renal pelvis persists or develops after the operation, or if there be an ulcerative pyelitis, or incrustation of the mucous lining of the pelvis or calices, then it is very likely that calcareous material will be deposited. At times the new stones escape through the ureter or through a drainage opening; the pyelitis under the better drainage gradually subsides and a cure results.

(2) *Failure to Remove All Stones or Fragments.*—In the removal of large coral calculi it often happens that loose and brittle fragments from the surface of the calculus are left behind in the extraction. As these fragments may escape into dilated calyces or be washed to the dependent portions of the renal pelvis or into the ureter and in any case are prone to be obscured by a deposit of blood clot, it is a frequent occurrence that such particles are left behind. Likewise, in the removal of crumbly calculi which fracture or disintegrate during the extraction, it is often almost impossible to remove every particle of stone. Again where there are numerous calculi pocketed in the different dilated loculi of the calyces one may readily overlook many particles. In cases such as these the fragments of residual stones may wash down the ureter or they may remain and serve as nuclei of other calculi which later demand removal.

(3) *Other foreign bodies*, especially blood clots, bits of suture, filaments of gauze or cotton, unintentionally left in contact with the urinary stream serve as points for the precipitation of salts and the formation of stones. A drainage tube in the kidney or renal pelvis probably also favors calcareous precipitation just as such a foreign body is known to do in the urinary bladder. Nephrostomy and the permanent drainage of a kidney by a catheter theoretically favor the formation of calculi, and in Case II of our series a nephrostomy was followed by the recurrence of many stones within the kidney. Also in Case V calculi apparently reformed under drainage by a nephrostomy.

(4) Finally it cannot be assumed that the factors giving rise to the primary stone have always been eradicated by the

operation or even by careful post-operative antilithic treatment. Therefore, a recurrent calculus may form from the same influences as did the primary one. Fortunately the majority of patients operated upon for stone in the kidney require no secondary operation for retained or recurrent calculi, although following the operation a persistent phosphaturia often associated with slight pyuria may continue for years without serious systemic effect. It is evident that surgical measures should be as thorough and complete as is feasible in the particular case, that no foreign bodies should be left along the course of the urinary stream, and when there is no infection, drainage should either be dispensed with or used for as brief a period as is consistent with the needs of the particular case. In not a few cases an immediate suture of the renal parenchyma and of the over-lying tissues without drainage may safely be carried out and will avoid the danger of secondary infection from the drain tract. While drainage through the loin is often demanded, a permanent nephrostomy opening is undesirable. Two of our cases showed progressive renal infection and tendency for calculus formation despite continuous drainage through the loin. We can endorse Watson's conclusion that nephrostomy is indicated only in certain desperate conditions, especially in malignant tumors of the bladder, and in those patients whose surroundings and mode of life enable the proper care of the apparatus. Repeated nephrolithotomies are preferable in the treatment of recurrent nephrolithiasis to nephrostomy.

The reformation of calculi is to be expected in cases in which the kidney has contained many stones, in those in which there is a well marked pyelitis, a dilated or imperfectly draining renal pelvis or ureter, large fragile calculi imbedded in the renal substance, or renal or ureteral fistulæ.

CASE I.—*Calculous anuria and recurrent renal calculi. Bilateral and consecutive operations including four nephrolithotomies, one nephrotomy, one nephrectomy, one drainage operation. Recovery.*

Mrs. H. D. M., married, aged 59. Multipara, of spare build, sallow complexion and well marked arterio-sclerosis. The patient for twenty years has suffered from indigestion, violent headaches and sacral backache. There was also dysuria and urinary tenesmus, which were believed to be due to a prociendia with a marked cystocele. Apart from an excess of urates the urine was apparently normal. In March, 1902, she came under my care when a plastic operation was performed upon the cervix and perineum together with a ventral fixation of the uterus. Following this operation the patient developed paroxysms of sharp pain radiating from the bladder toward the groin and left loin. About the fourth of September, 1902, the patient had a sensation of great hunger; she ate heartily and that night very severe, sharp, cutting pains developed in the left lumbar region which radiated toward the bladder. The patient vomited, the abdomen became tympanitic, there was a suppression of urine, and obstipation with retention of flatus. The temperature rose to 103 or 104 and the patient became delirious. Complete anuria persisted about twenty-four hours and by the fourth day the abdominal distention had partially subsided and it was possible to distinguish a large, oval mass of the size of a coconut in the left upper abdominal quadrant. In the right loin there was a renal shaped mass two or three times the size of a normal kidney which was not painful or tender. The fever and delirium persisting, on the sixth day of the attack a bilateral nephrotomy and a right nephrolithotomy were performed under ether. On the left side there was a large uronephrosis and a dilated ureteral orifice. No stone was found and while it was believed that there was a stone blocking the ureter the patient's condition forbade prolonged search. The right kidney contained a large fragile coral calculus filling the pelvis and the calyces below the equator of the kidney. The stone was disentangled from the renal substance with some difficulty and removed. Both wounds were drained, the patient progressively improved and during the convalescence passed two fragments of stone. The right sinus closed in about two weeks, the left after several months. In October and November, 1905, the patient complained of pain in the right loin, loss of appetite, insomnia and headache. The urine was slightly albuminous and contained tenacious shreds of muco-pus. A skiagraph by Dr. Pfahler showed the presence of calculi in

both kidneys. The patient's abdominal walls were so thin *that the stones in the shrunken left kidney could be palpated between the two hands*. A bilateral nephrolithotomy was then performed, four stones being removed from one and three stones from the other kidney. The sinuses soon closed but in 1904 paroxysms of nausea and abdominal tympany with pains in the left loin developed finally a small pyelonephrosis with secondary perinephritic abscess. A simple drainage operation was done under local anesthesia. The left ureter was evidently obliterated and a persistent urinary sinus remained, which was so troublesome that on January 5, 1905, a left nephrectomy was done under the nitrous oxide-ether sequence. In the latter part of 1905, the patient was again troubled with attacks of colic involving the remaining kidney. It was considered inadvisable to administer ether or even make a skiagraph, and on January 1, 1906, under spinal anesthesia by stovaine, the third consecutive nephrolithotomy was performed upon the right kidney and five moderate sized stones were removed. After this operation twelve ounces of bloody urine were secreted during the first twenty-four hours; about twenty-four ounces the second day; and increasing quantities thereafter; whereas after the previous nephrectomy, the first day 46½ ounces were excreted; the second day 34 ounces; the third day 22 ounces and the fourth day 60 ounces. At the present time (December, 1907), nearly two years after the last operation, the patient is active and fairly vigorous; the urine is excreted in excessive quantities, varies in specific gravity from 1.010 to 1.015 and contains a moderate amount of albumin and varying amounts of mucus. There is no clinical evidence indicating further reformation of calculi.

CASE II.—*Recurrent nephro-lithiasis with secondary pyelonephrosis. Repeated nephrotomies or nephrolithotomies. Bilateral nephrostomy followed by progressive suppuration and recurrence of calculi in one kidney. Nephrectomy and abolition of renal drainage. Recovery.*

Miss N. K., age 22, of slight build, and of poor development, had suffered from nocturnal enuresis as a child and always had been troubled by urinary frequency. When sixteen an attack of influenza was followed by aching in both loins with pain radiating to the bladder. The right side was the more painful and was very sensitive to the touch. When eighteen years of age a right

nephrolithotomy was performed; the wound closed in three weeks and the patient remained well about one year. The left loin then became painful, and when twenty years of age the left kidney was opened and forty-six small stones were removed. The incision remained open for two months, was very painful and was complicated by the formation of small recurrent abscesses. Two months later the right side became painful, and when the patient was twenty-one both kidneys were opened by two operators working simultaneously and recurrent stones found in the right kidney. A bilateral nephrostomy was performed. After this operation the patient suffered from difficulty in securing adequate drainage and from recurrent pus collections in the left side. About six months later the left nephrostomy opening was enlarged under local anesthesia, pus evacuated and calculi removed. Later it became difficult to reinsert the tube after its removal for purposes of cleansing, and at times the nephrostomy openings required dilatation. Finally the left catheter could only be introduced when upon a specially curved stylet. The patient first came under my observation October 5, 1907. Catheters had then been worn continuously in both kidneys since May, 1906. The urine from the right kidney is moderately turbid, but from the left kidney is very purulent and offensively ammoniacal. On expression quantities of foul pus exude from the left loin especially after the removal of the drainage catheter. The injection of colored fluids into the renal pelves proves a free communication from the right kidney to the bladder and complete obstruction below the pelvis of the left kidney. The skiagram shows multiple calculi in the region of the left kidney but none in the right. The patient was admitted to the Samaritan Hospital but despite diet, urinary antiseptics and renal irrigations together with the dilatation of the opening the left nephrostomy failed to drain properly and the suppuration and ammoniacal decomposition in the left kidney continued. On November 5, 1907, under spinal anesthesia by tropa-cocaine, a left nephrectomy together with the removal of the upper part of the ureter was performed. A large cylindrical calculus completely occluded the upper extremity of the left ureter and there were numbers of small stones in the renal pelvis and some of the dilated calyces were packed with concretions. The cortex was thin and the greater part of the kidney was occupied by a series of fetid pus distended

cavities not freely communicating with the renal pelvis. The right nephrostomy opening was dilated and then permitted to close spontaneously. Following the removal of the right nephrostomy tube the opening rapidly contracted and there was very little leakage through the back. Relieved of the suppuration, the constant dread of the nephrostomy tubes slipping, of the discomforts of renal irrigation, and the continuous annoyance of an ammoniacal nephrostomy harness, the patient ten days after the operation showed great mental as well as physical improvement. Later the residual kidney became painful, fever developed and the nephrostomy drainage had to be renewed temporarily.

CASE III.—*Right nephrolithiasis mistaken for appendicitis. Appendectomy. Nephrolithotomy and removal of over twenty calculi. Recurrent colic, secondary nephrotomy. Recovery.*

Mr. S. K., age 59. Manufacturer. Plethoric. For many years has had paroxysms of pain in the region of McBurney's point. He alternates between diarrhoea and constipation, sleeps well, has a good appetite, some indigestion, and is morose and irritable. Seven years ago the pain and tenderness were so great that an appendectomy was done but the frequent attacks of colic in the right side continued and a secondary operation was considered for adhesions which it was believed had formed about the colon. I first saw the patient in 1903, when it was said he had been rejected for life insurance because of albuminuria. On examination no albumin was found in the urine but later the patient was seen at his house in a violent paroxysm of pain following which a few erythrocytes were found in the urine. There was a distinctly tender, rather indefinite mass in the region of the right kidney, and the jar of walking or of car riding produced pain in the right loin. There had been no typical ureteral colic. In May, 1903, under ether anesthesia, over twenty stones or calcareous fragments were removed from the right kidney. These occupied in part the pelvis and a part of the dilated calyces, the different cavities having such small communicating openings that four separate incisions through the cortex were necessary for their removal. Gauze drainage was used to the kidney, the patient soon improved. Later there was a return of pain in the kidney which was relieved by a secondary nephrotomy about three months after the first operation. The mental depression

then disappeared and the patient continued well over four years from the time of the second operation.

CASE IV.—*Calculus in the right renal pelvis mistaken for appendicitis. Appendectomy. Removal of the calculus through an incision in the renal pelvis with suture, drainage. Secondary pyelonephrosis and urinary fistula with recurrent calculi. Nephrectomy. Recovery.*

Mr. X. Single, age 24. Physical condition and development good. The patient had suffered from recurrent attacks of pain in the neighborhood of McBurney's point for which an appendectomy was done about two years ago. The operation failed to relieve the patient of the attacks of colic which continued in the region of the appendix with some tenderness in the right loin. The urine contained a small quantity of pus and blood. The kidney was exposed and a calculus about one centimeter in diameter found in the renal pelvis. The stone was removed by an incision through the pelvis of the kidney which was sutured and a small gauze drain introduced through the wound to the line of suture. The patient left the hospital apparently improved but a urinary sinus formed in the region drained and later the patient developed signs of pyelonephrosis. About four months after the second operation the patient first came under my care, and under scopolamin-morphin anesthesia the suppurating kidney was removed. There had been no recurrence of calculi in the renal pelvis. The patient made a good recovery. This case well illustrates the danger of urinary fistula and renal infection after the removal of calculi through the pelvis of the kidney. The danger is much increased if the gauze or drainage tube be left against the line of suture. Had the stone been primarily removed by incision through the renal cortex the necessity for a secondary nephrectomy would have been less likely.

CASE V.—*Nephrolithiasis, uronephrosis, uroureter; nephrolithotomy, nephrostomy. Imperfect drainage of distended ureter. Development of pyelonephrosis. Secondary nephrectomy and ureterectomy. Death.*

Mr. W. C., aged 25. American, clerk. Fairly well developed but not robust, was admitted to the Samaritan Hospital September 21, 1905. For more than a year he had suffered from recurrent attacks of colicky pains in the lower left abdominal quadrant, which began and ended rather abruptly and were associated with

formation of a globular mass palpable about the left sacral brim. These attacks interfered with the patient's work, and were gradually undermining his health. Diagnosis of intermittent uronephrosis and ureter was made and under scopolamin-morphin narcosis the left kidney was opened September 26, 1905. The pelvis was dilated and through the pelvis the finger could be passed into a greatly dilated ureter. An attempt to pass a sound from the kidney into the bladder failed, the instrument being arrested just below the pelvic brim. A number of small calculi were removed and as the patient's condition on the operating table became critical the ureter was drained by a tube passed through the wound in the kidney and the patient returned to bed. The greatly enlarged ureter failed to drain properly so that despite irrigation and a tube passed through the nephrostomy opening there was a constant tendency for residual urine to remain in the ureter. The temperature was irregular varying from normal to $102^{\circ}\frac{2}{10}$, and as a rule the pulse ranged from 90 to 110. From time to time small calculi were washed from the kidney or ureter. As the patient became progressively weaker, a second operation was attempted October 26th. The man was again anesthetized by scopolamin-morphin, the kidney was exposed, and adjacent to the wound tract many miliary abscesses were found. A second incision was made above and nearly parallel to Poupart's ligament on the left side, the peritoneum pushed forward until the thick wall of the ureter, which had a diameter of 3 or 4 cm., could be exposed, isolated and divided low down. The kidney and upper end of the ureter were then freed through the incision in the loin and the kidney with the attached ureter removed. The wound was packed with gauze and the patient, very weak, was hurried to bed. Several hours later there was some oozing from the wound and the packing was renewed. The patient grew rapidly weaker, the temperature rose to 105.4° F. and death occurred about nine hours after the operation. For this patient perhaps a better primary operation would have been a nephrectomy or a ureterostomy, the ureter being brought out through the loin. With uretero-vesical anastomosis in such a case there is a question if the dilated ureter would not serve as a pocket for residual urine and be a cause of later trouble.

CASE VI.—*Nephrolithiasis, ureterolithiasis, vesicolithiasis. Litholapaxy and secondary nephrolithotomy. Recovery.*

Mr. I. H., aged 30, tailor. Previous family history negative. Well nourished and developed. Enjoyed good health until three years ago when colicky pain developed in the right loin and was followed by the passage of a small amount of blood in the urine. The patient was free from pain for two years when there was a second attack of colic; since the second attack there have been repeated attacks involving the left loin but the right side is free from pain. Recently there has been a sudden cessation of the stream during urination followed by the passage of a few drops of blood stained urine. There is much irritability of the bladder with frequent urination. Skiagrams show a small shadow in the region of the pelvis of the left kidney, small shadows in the region of the lower end of the left ureter and also larger shadows in the area of the bladder. The patient was admitted to the Samaritan Hospital May 28, 1907, and two days later the vesical calculi were crushed and evacuated under spinal anesthesia. The operation demonstrated the importance of cystoscopy after litholapaxy to prove that all fragments have been removed. A few days after this a small stone was removed from the left renal pelvis.

As the stones in the lower end of the right ureter were producing no symptoms, and as they were so small that there was a possibility of their passing into the bladder, no attempt was made at their removal. The patient made an uninterrupted recovery and was discharged from the hospital seventeen days after the nephrolithotomy. Six months later the patient continued free from colic.

CASE VII.—*Left ureteral colic due to right nephrolithiasis. Operation, exploration of both kidneys; left nephrolithotomy. Return of colic; passage of large calculi; final recovery.*

Mrs. J. C., aged 38. Had suffered from recurrent attacks of numbness and colicky pain in the left loin for seven years. For the past two years the paroxysms have been much more severe. About January, 1906, the patient, after an attack of colic, passed a number of fair sized phosphatic stones. The X-ray showed about five calculi in the region of the right kidney but none in the region of the left. The patient has never had pain upon the right side. The urine was alkaline, had a specific gravity of 1.018; contained a trace of albumin; no sugar; and the microscope showed a moderate number of leucocytes, phosphatic crystals and some mucus. The patient was admitted to the Samaritan

Hospital March 14, 1906, and the same day both kidneys were explored under scopolamin-morphin narcosis. The left kidney was negative, and the kidney was at once replaced and the wound closed. The right kidney was incised and a number of calculi removed from the dilated pelvis. The right side was drained and the sinus remained open, with intermissions, until the following fall. During the summer the attacks of renal colic returned and in November, 1906, the patient again passed a number of phosphatic calculi after a severe paroxysm of ureteral colic. Since this time there has been no definite attack of colic and although the urine still contains mucus, a small quantity of albumin, and a moderate number of pus cells there is no symptomatic evidence of the return of the calculi.

CONCLUSIONS.

(1) In the absence of infection bilateral or consecutive operations upon the kidneys are well borne.

(2) Nephrolithotomy is frequently followed by the reformation of stone in the kidney.

(3) Nephrostomy may not only fail to cure, arrest or prevent pyelonephrosis or relapsing nephrolithiasis but may even favor these conditions.

(4) In operating for simple calculous disease of the kidneys spinal anesthesia by tropa-cocaine or stovaine is to be temporarily and with the most rigid aseptic precautions.

(5) In bilateral and consecutive operations upon the kidneys spinal anesthesia by tropa-cocaine or stovaine is to be preferred.